

Figure 1(a) 6" x 6" setup reticle for the preferred embodiment (10 x 12 field point array)

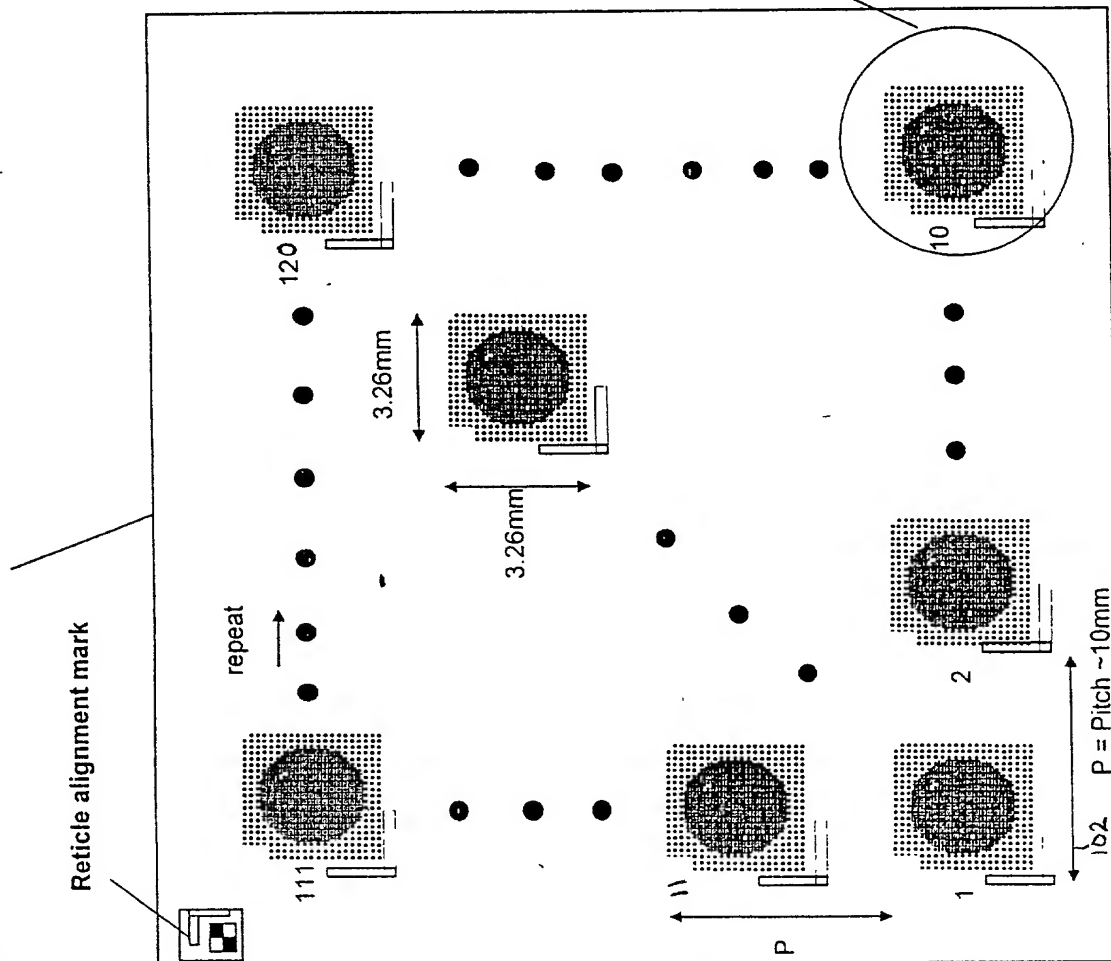


Figure 1(b) side view of preferred setup reticle plate

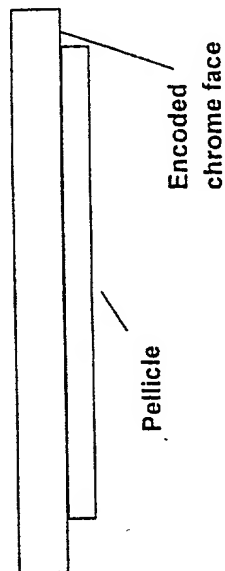
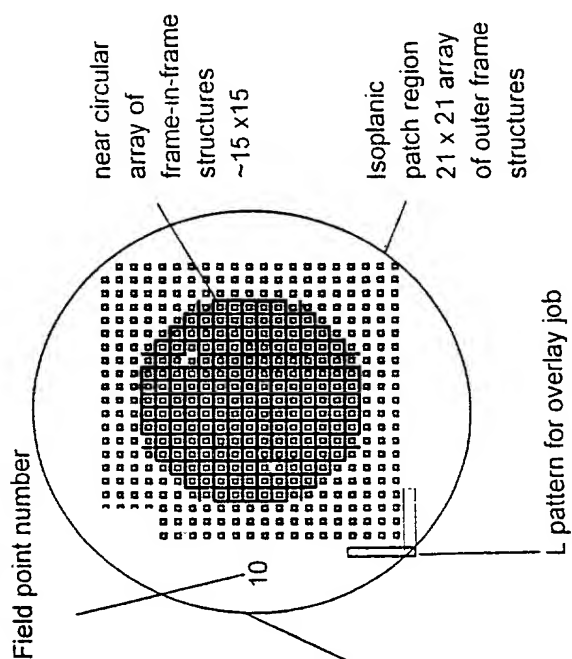


Figure 1(c) - detail of field point



mm = millimeters, um = microns

Figure 1(d) Preferred embodiment - typical wafer level exposure pattern

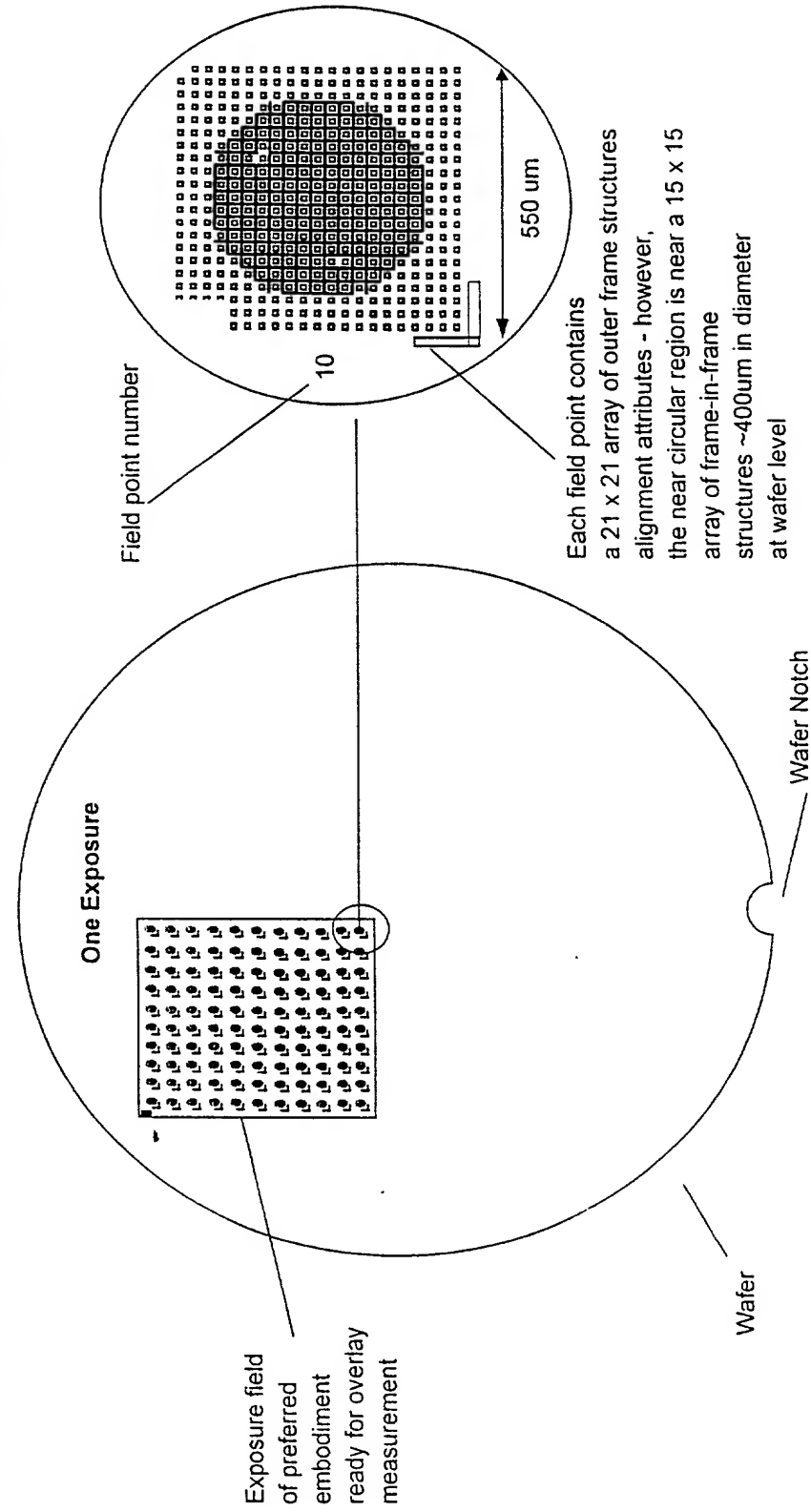


Figure 1(e) - detail of field point

Figure 2(a) Prior Art Printed ISI reticle image (two exposures) from U.S. Patent 5,978,085 – one field point

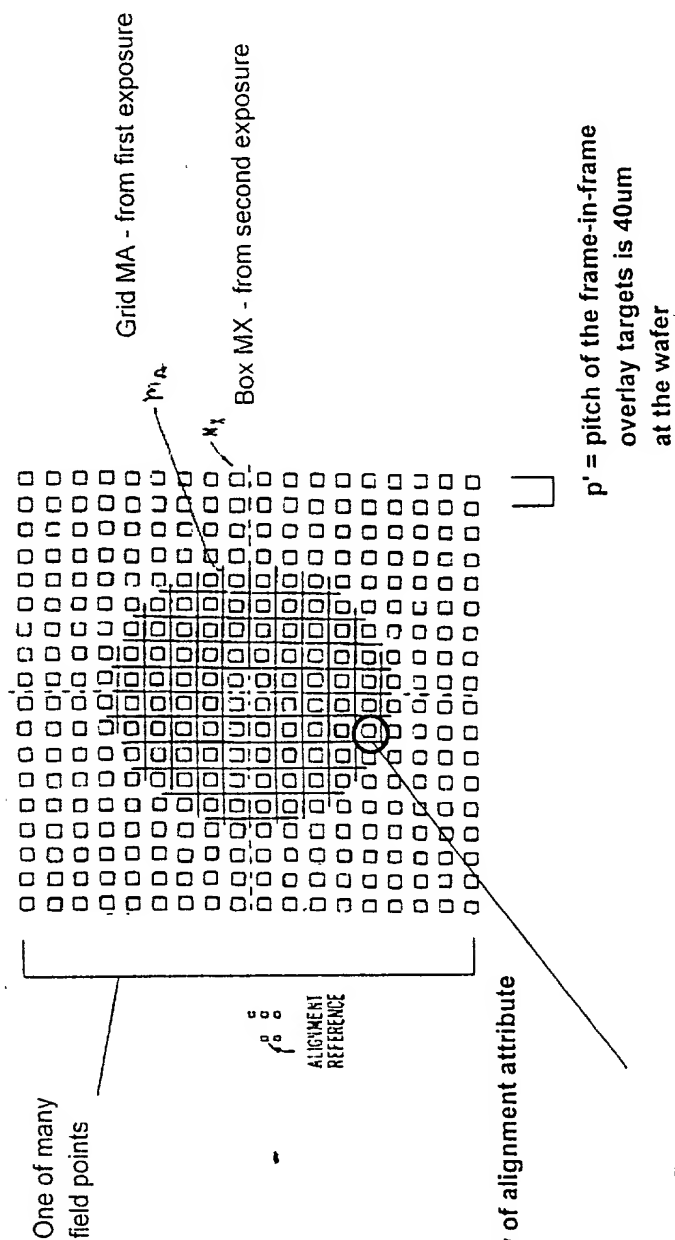


Figure 2(b) close-up view of alignment attribute

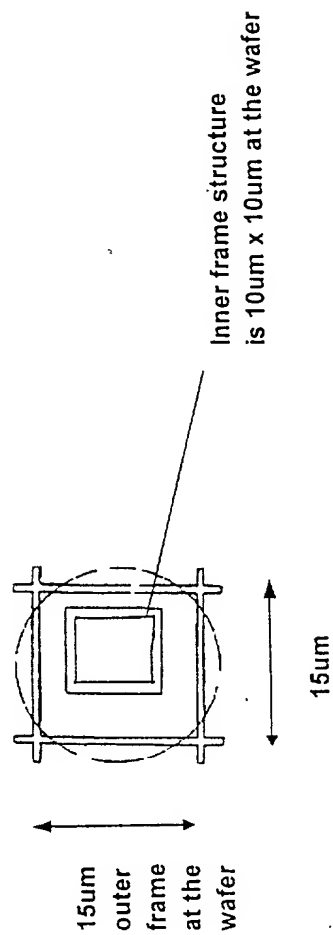


Figure 3 Diagram of ISA coordinates for a given field point

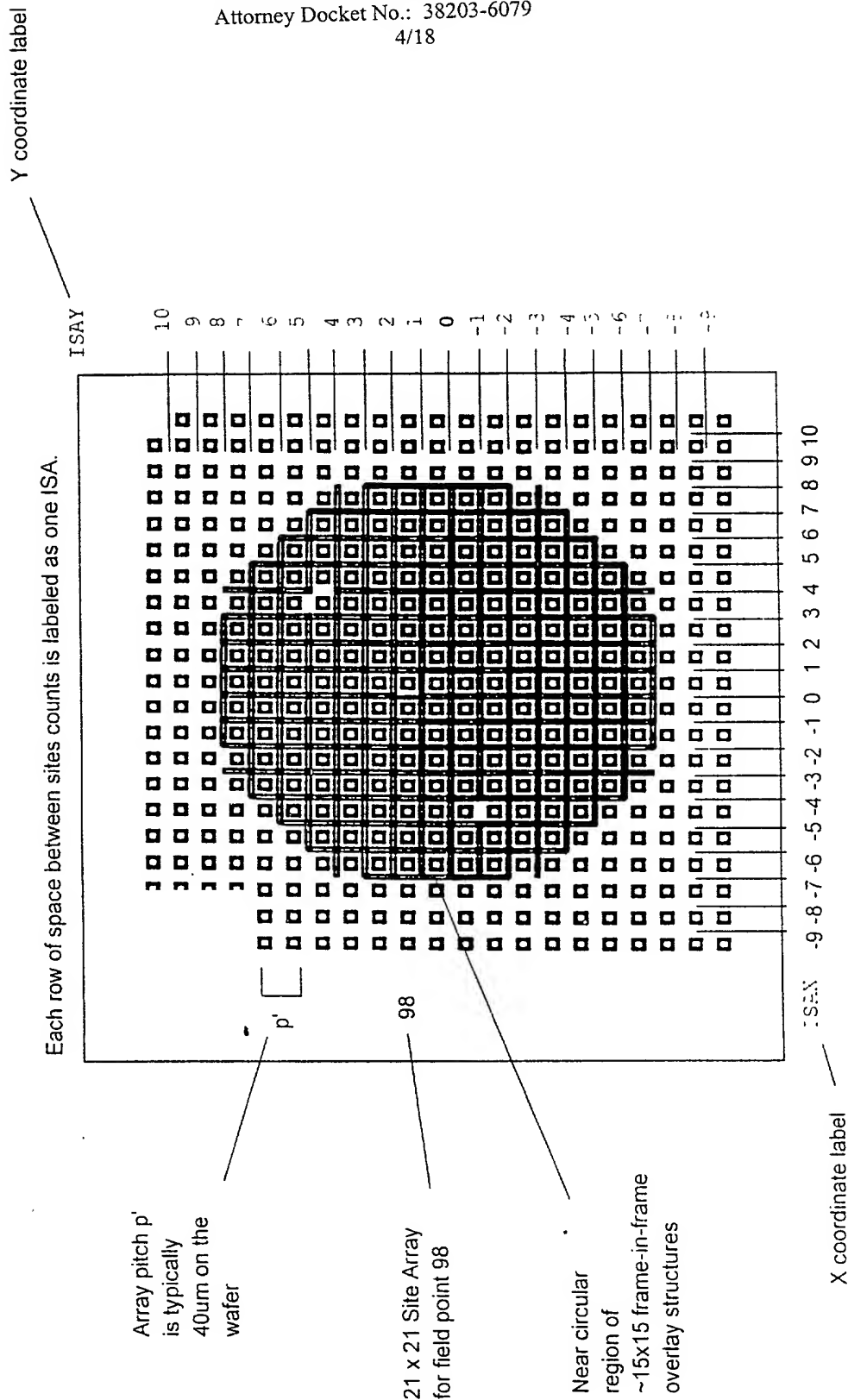
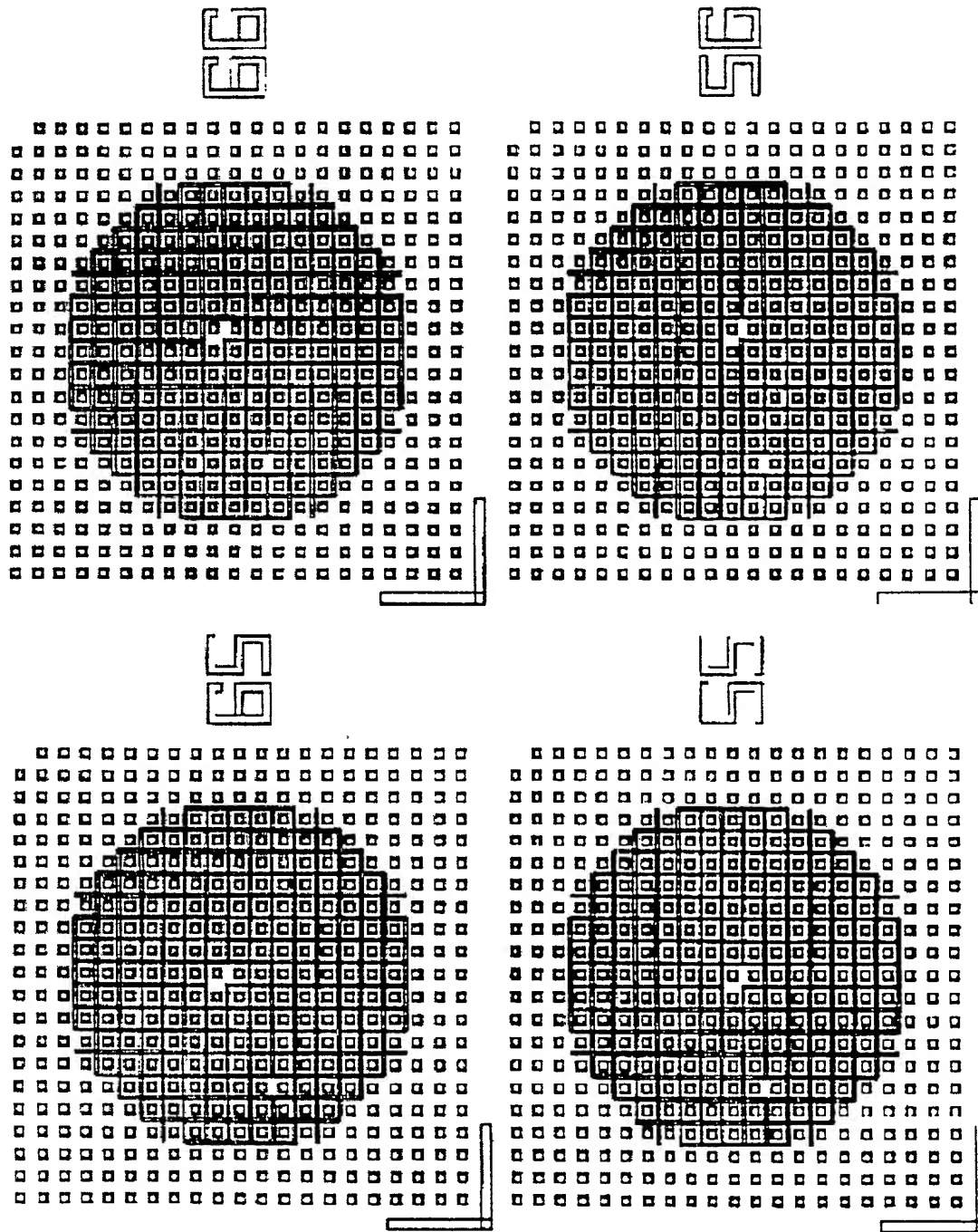
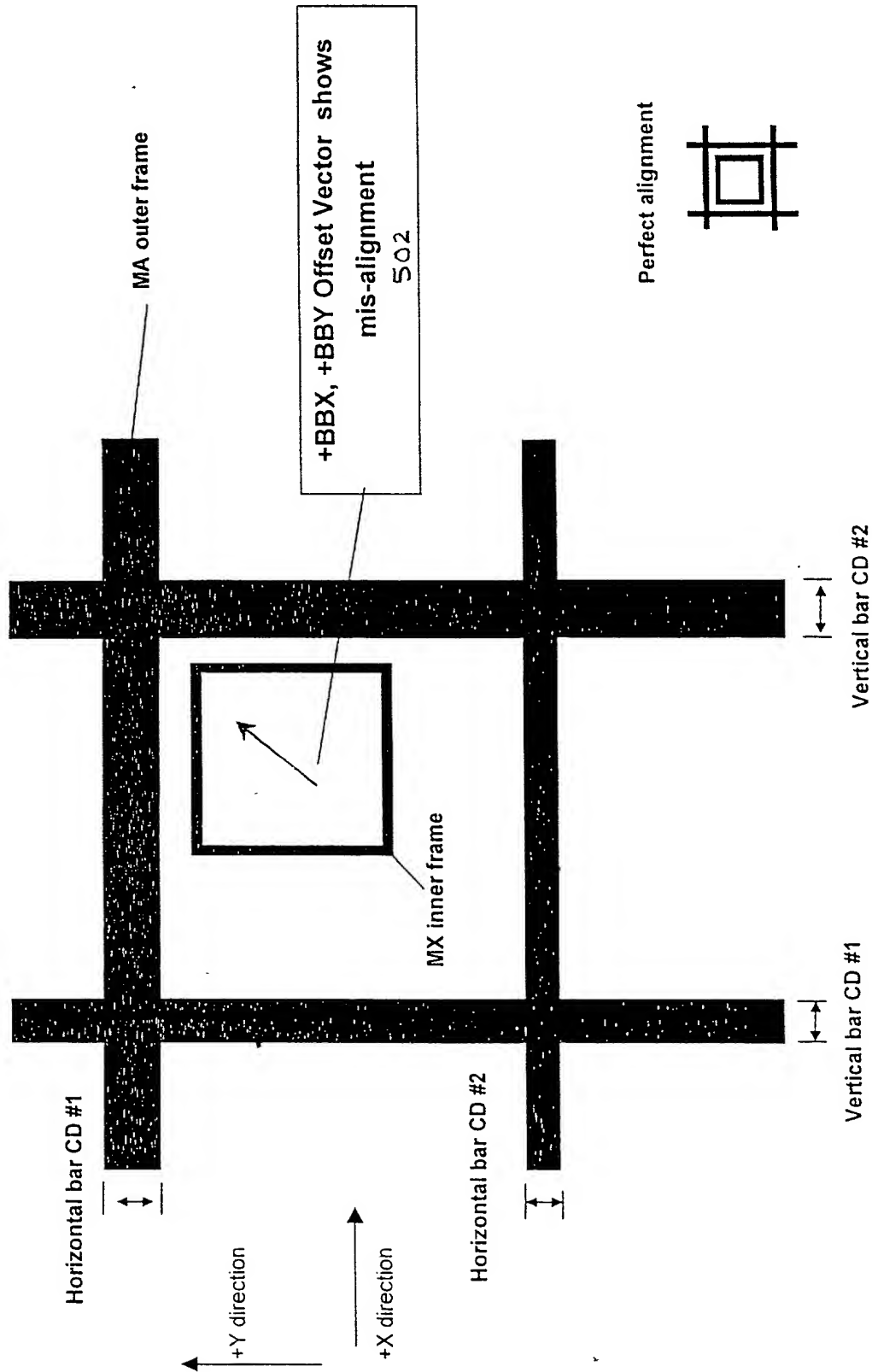


Figure 4(a) Site arrays of field points
55,56,65,66 for the preferred embodiment



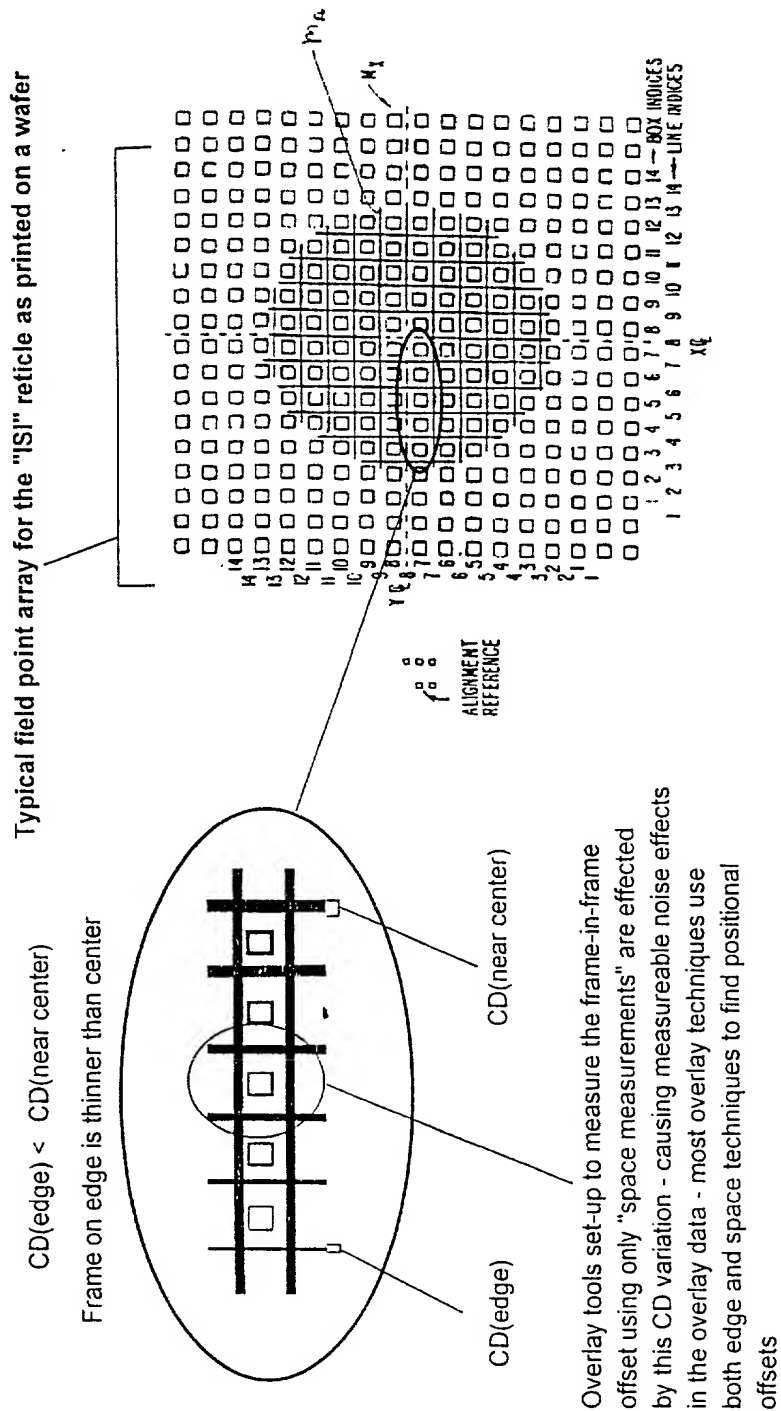
$$IXFP = 8, IYFP = 10$$

Figure 5(a) Sign convention for BBX and BBY offsets and fourth encoding scheme at wafer level
The small inner frame is shown mis-aligned to the larger outer frame this produces
an x-shift and y-shift overlay positional offset (+BBX and +BBY)



Prior Art.

Figure 5(b) Typical Overlay errors



Prior Art

Figure 5d, Bar in box or frame in box
measurement producing non zero offset in
presence of CD variation ($CDL > CDR$).

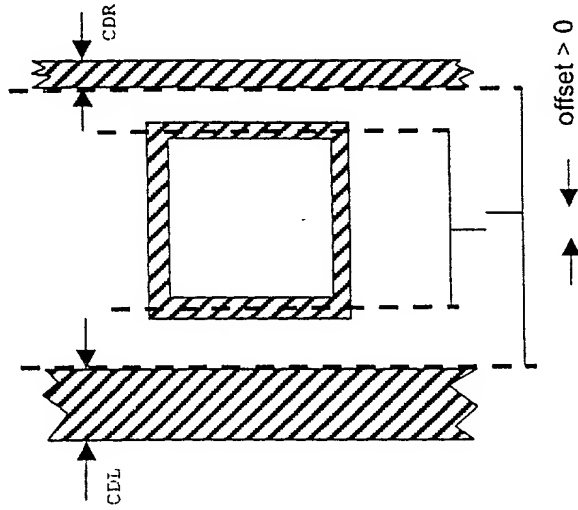


Figure 5c, Bar in bar or frame in frame
measurement producing 0 offset in presence of
CD variation ($CDL > CDR$).

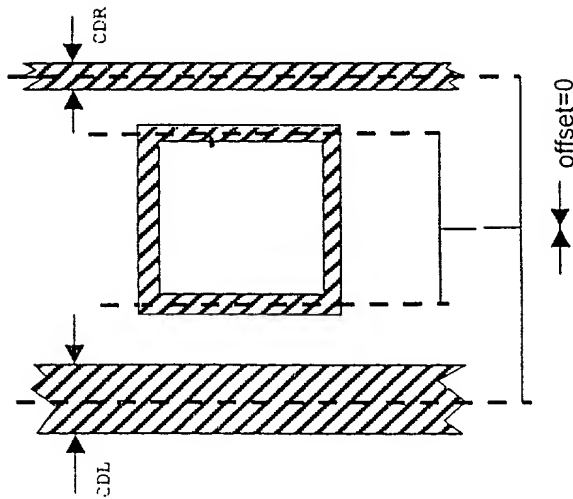


Figure 6 First two encoding schemes - missing-bar layout for field point

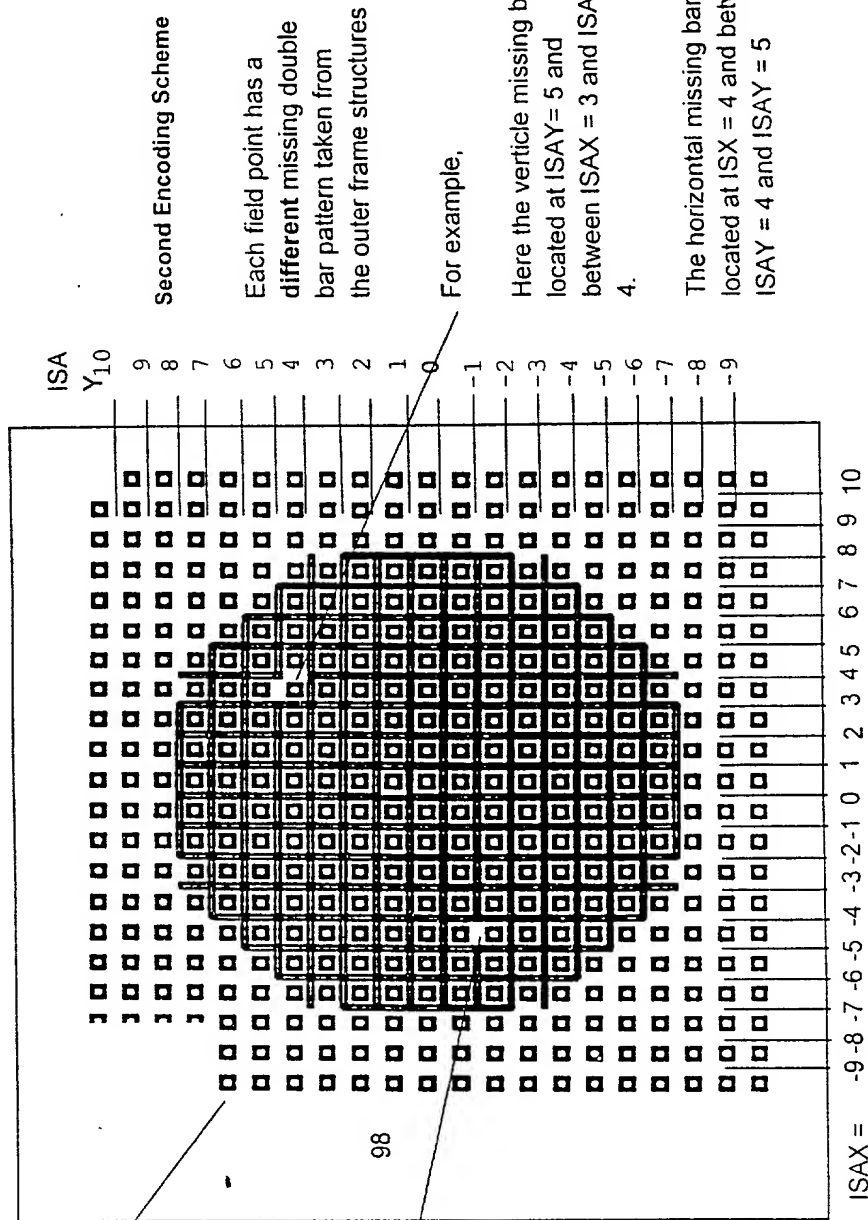
98

21 X 21 array of outer frame
structures for this site array

First Encoding Scheme

Every field point has the exact
same single missing horizontal
bar taken from an outer frame
structure.

For example, the lone missing
horizontal bar is located at
ISAY = -1 and between
ISAX = -4 and ISAX = -5



98 = df

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BBx BBY

Figure 8 location of (0,0) point of frame-in-frame data on setup reticle

IX0 = position within 21 x 21 array where (BBx,BBy) = (0,0) occurs
IY0
FP = field point number

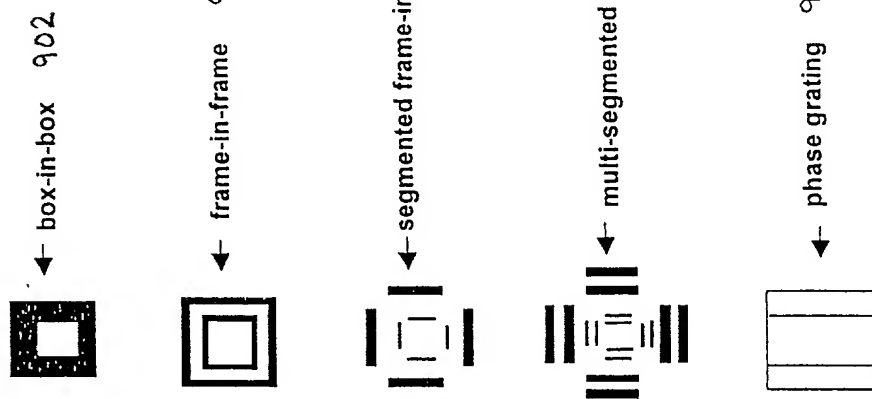
IY=Row

12	7 17 111	8 17 112	9 17 113	10 17 114	11 17 115	12 17 116	13 17 117	14 17 118	15 17 119	16 17 120
11	7 16 101	8 16 102	9 16 103	10 16 104	11 16 105	12 16 106	13 16 107	14 16 108	15 16 109	16 16 110
10	7 15 91	8 15 92	9 15 93	10 15 94	11 15 95	12 15 96	13 15 97	14 15 98	15 15 99	16 15 100
9	7 14 81	8 14 82	9 14 83	10 14 84	11 14 85	12 14 86	13 14 87	14 14 88	15 14 89	16 14 90
8	7 13 71	8 13 72	9 13 73	10 13 74	11 13 75	12 13 76	13 13 77	14 13 78	15 13 79	16 13 80
7	7 12 61	8 12 62	9 12 63	10 12 64	11 12 65	12 12 66	13 12 67	14 12 68	15 12 69	16 12 70
6	7 11 51	8 11 52	9 11 53	10 11 54	11 11 55	12 11 56	13 11 57	14 11 58	15 11 59	16 11 60
5	7 10 41	8 10 42	9 10 43	10 10 44	11 10 45	12 10 46	13 10 47	14 10 48	15 10 49	16 10 50
4	7 9 31	8 9 32	9 9 33	10 9 34	11 9 35	12 9 36	13 9 37	14 9 38	15 9 39	16 9 40
3	7 8 21	8 8 22	9 8 23	10 8 24	11 8 25	12 8 26	13 8 27	14 8 28	15 8 29	16 8 30
2	7 7 11	8 7 12	9 7 13	10 7 14	11 7 15	12 7 16	13 7 17	14 7 18	15 7 19	16 7 20
1	7 6 1	8 6 2	9 6 3	10 6 4	11 6 5	12 6 6	13 6 7	14 6 8	15 6 9	16 6 10
	1	2	3	4	5	6	7	8	9	10

IX=Col

204070" 92463007

Figure 9 Typical overlay patterns
or completed alignment attributes



Prior Art

204070" 9246E00T

Figure 10 Photolithographic stepper or scanner system

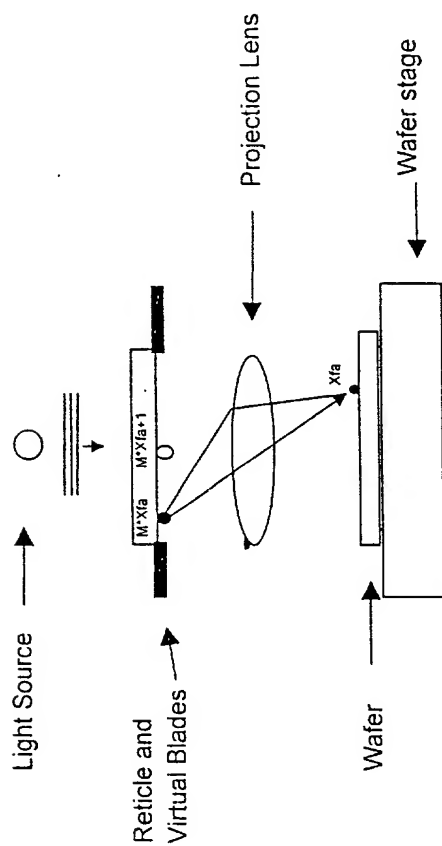


Figure 11 Process flow for a method of verifying proper order of a job deck.

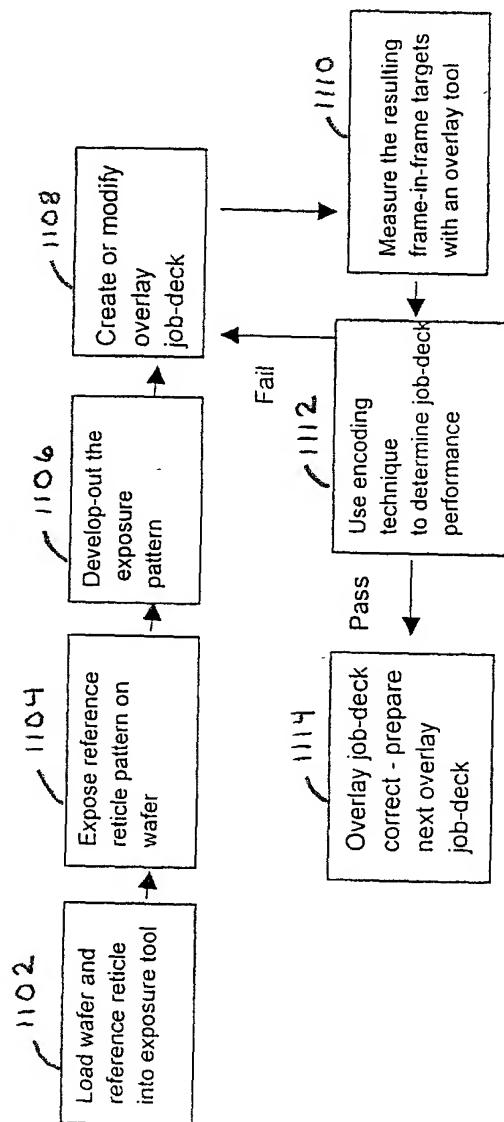


Figure 12 Reticle and resist frame-in-frame description for a typical ISA coordinate site ISAX, ISAY

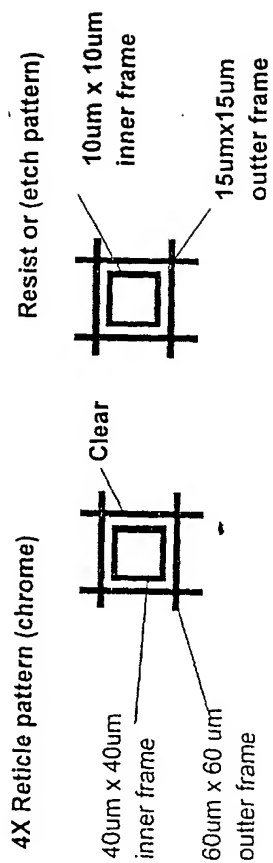


Figure 13 Centered Frame-in-Frame structure No shift: ISAX = 0, ISAY = 0

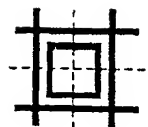
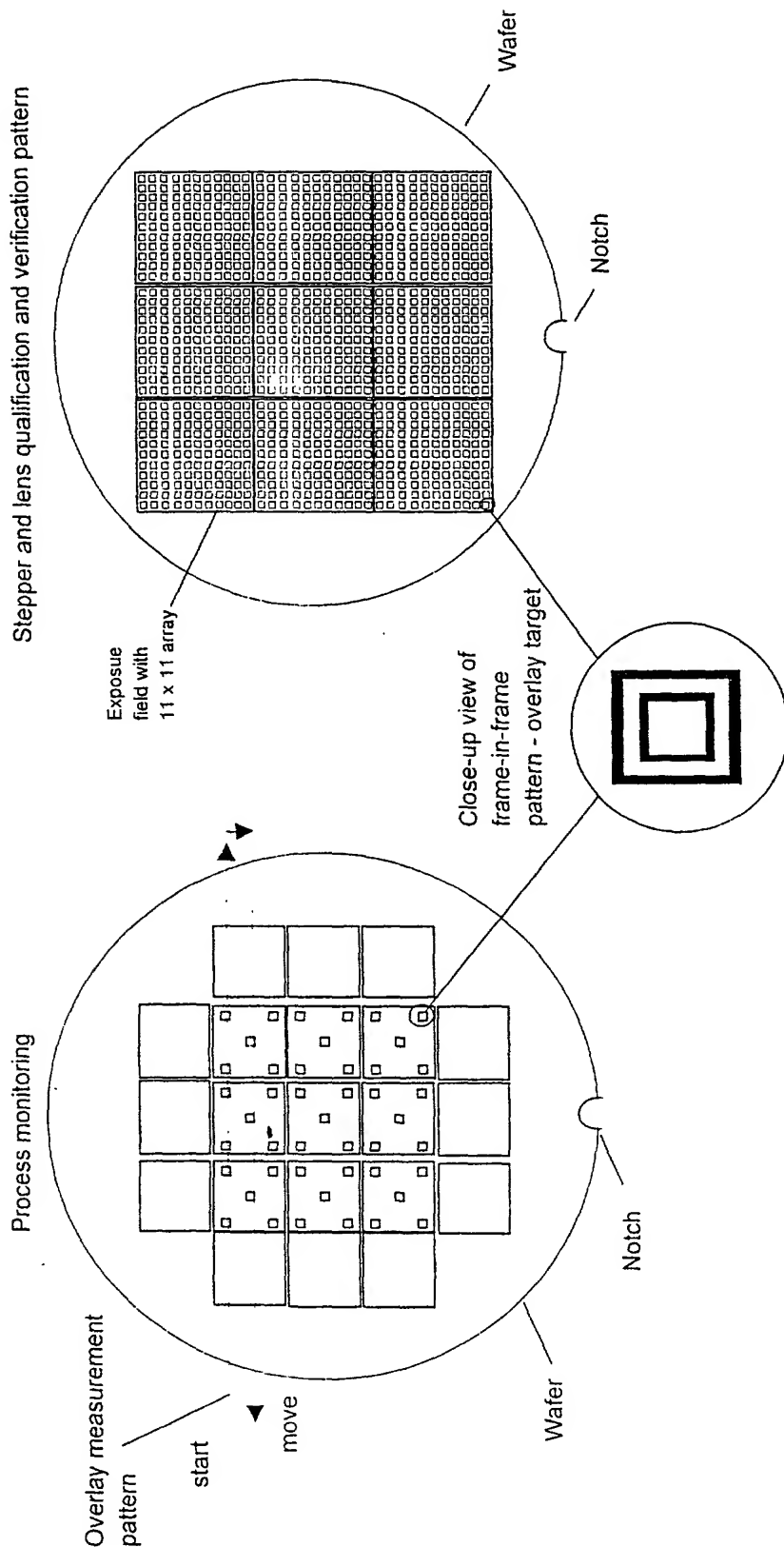


Figure 14 Prior art - exposure patterns: Process monitoring and Stepper qualification



Prior Art

Figure 15(a) Process flow for prior art - Photolithographic tool set-up

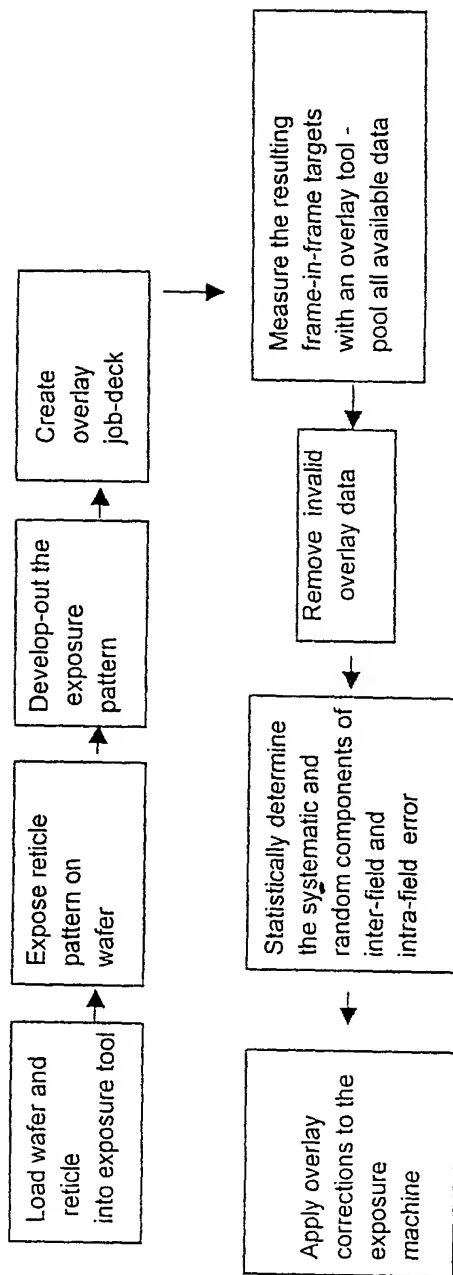


Figure 15(b) Process flow for prior art - Production use of overlay

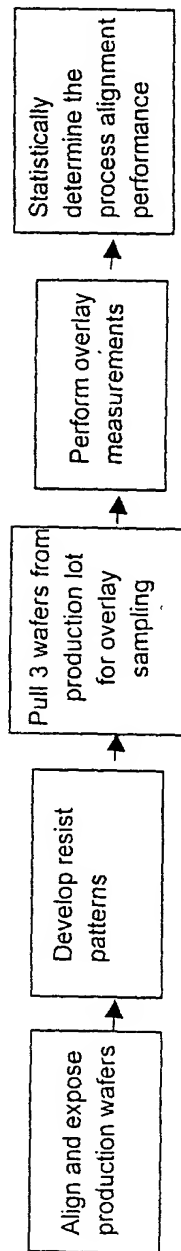


Figure 15(c) Process flow for prior art - lens aberration measurement

